NAME ______________________ DATE ____________ PERIOD ____________

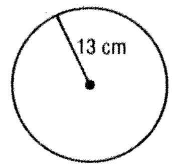
10-1 Study Guide and Intervention *(continued)*

Circles and Circumference

Circumference The **circumference** of a circle is the distance around the circle.

Circumference	For a circumference of C units and a diameter of d units or a radius or r units, $C = \pi d$ or $C = 2\pi r$

Example **Find the circumference of the circle to the nearest hundredth.**



$C = 2\pi r$	Circumference formula
$= 2\pi(13)$	$r = 13$
$= 26\pi$	Simplify.
≈ 81.68	Use a calculator.

The circumference is 26π about 81.68 centimeters.

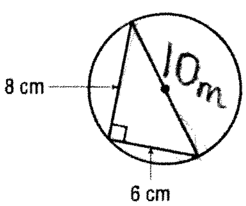
Exercises

Find the diameter and radius of a circle with the given circumference. Round to the nearest hundredth.

1. $C = 40$ in. $d \approx 12.73$ in $r \approx 6.37$
2. $C = 256$ ft
3. $C = 15.62$ m $d \approx 4.97$ m $r \approx 2.49$ m
4. $C = 9$ cm
5. $C = 79.5$ yd $d \approx 25.31$ yd $r \approx 12.65$ yd
6. $C = 204.16$ m

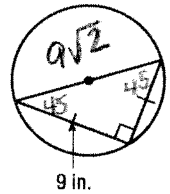
(π)

Find the exact circumference of each circle using the given inscribed or circumscribed polygon.

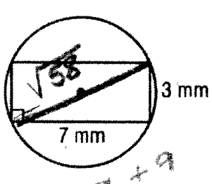
7. 

$C = \pi d$

$C = 10\pi$ cm

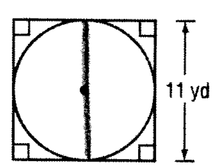
8. 

$C = 9\sqrt{2}\,\pi$ in

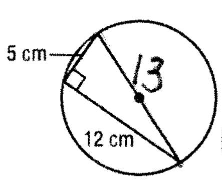
9. 

$49 + 9$

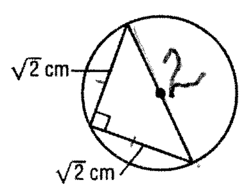
$C = \sqrt{58}\,\pi$ mm

10. 

$C = 11\pi$ yd

11. 

$C = 13\pi$ cm

12. 

$C = 2\pi$ cm

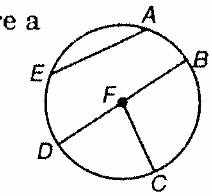
$\sqrt{2} \cdot \sqrt{2} =$
2

NAME ____________ DATE ________ PERIOD ________

10-1 Study Guide and Intervention

Circles and Circumference

Segments in Circles A **circle** consists of all points in a plane that are a given distance, called the **radius**, from a given point called the **center**.



chord: $\overline{AE}$, $\overline{BD}$

radius: $\overline{FB}$, $\overline{FC}$, $\overline{FD}$

diameter: $\overline{BD}$

A segment or line can intersect a circle in several ways.

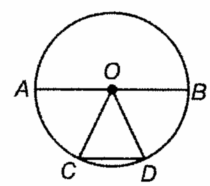
- A segment with endpoints that are at the center and on the circle is a **radius**.
- A segment with endpoints on the circle is a **chord**.
- A chord that passes through the circle's center and made up of collinear radii is a **diameter**.

For a circle that has radius r and diameter d, the following are true

$r = \frac{d}{2}$ $\quad$ $r = \frac{1}{2}d$ $\quad$ $d = 2r$

Lesson 10-1

Example



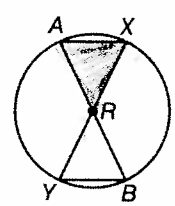
a. Name the circle.
The name of the circle is $\odot O$.

b. Name radii of the circle.
$\overline{AO}$, $\overline{BO}$, $\overline{CO}$, and $\overline{DO}$ are radii.

c. Name chords of the circle.
$\overline{AB}$ and $\overline{CD}$ are chords.

Exercises

For Exercises 1–7, refer to



1. Name the circle. $\odot R$

2. Name radii of the circle.
$\overline{RA}$, $\overline{RB}$, $\overline{RY}$ and $\overline{RX}$

3. Name chords of the circle.
$\overline{AX}$, $\overline{AB}$, $\overline{YB}$, $\overline{YX}$

4. Name diameters of the circle.
$\overline{AB}$, $\overline{XY}$

5. If $AB = 18$ millimeters, find AR.
9 mm

6. If $RY = 10$ inches, find AR and AB.
AR = 10 in AB = 20 in

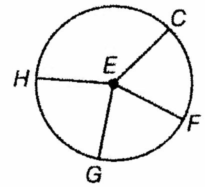
7. Is $\overline{AB} \cong \overline{XY}$? Explain.
Yes, all diameters of the same circles are $\cong$

NAME ______________________ DATE __________ PERIOD __________

10-2 Study Guide and Intervention

Measuring Angles and Arcs

Angles and Arcs A **central angle** is an angle whose vertex is at the center of a circle and whose sides are radii. A central angle separates a circle into two arcs, a **major arc** and a **minor arc**.



$\widehat{GF}$ is a minor arc.
$\widehat{CHG}$ is a major arc.
$\angle GEF$ is a central angle.

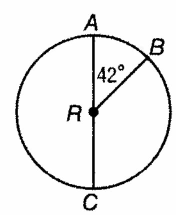
Here are some properties of central angles and arcs.

- The sum of the measures of the central angles of a circle with no interior points in common is 360. — $m\angle HEC + m\angle CEF + m\angle FEG + m\angle GEH = 360$
- The measure of a minor arc is less than 180 and equal to the measure of its central angle. — $m\widehat{CF} = m\angle CEF$
- The measure of a major arc is 360 minus the measure of the minor arc. — $m\widehat{CGF} = 360 - m\widehat{CF}$
- The measure of a semicircle is 180.
- Two minor arcs are congruent if and only if their corresponding central angles are congruent. — $\widehat{CF} \cong \widehat{FG}$ if and only if $\angle CEF \cong \angle FEG$.
- The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs. **(Arc Addition Postulate)** — $m\widehat{CF} + m\widehat{FG} = m\widehat{CG}$

Lesson 10-2

Example $\overline{AC}$ **is a diameter of** $\odot R$**. Find** $m\widehat{AB}$ **and** $m\widehat{ACB}$**.**

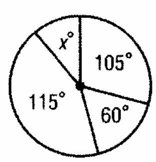
$\angle ARB$ is a central angle and $m\angle ARB = 42$, so $m\widehat{AB} = 42$.
Thus $m\widehat{ACB} = 360 - 42$ or 318.



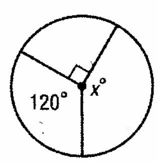
Exercises

Find the value of x.

360°

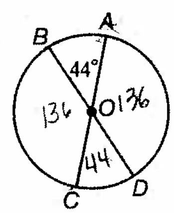
1. 

$m\angle x = 80°$

2. 

$m\angle x = 150°$

$\overline{BD}$ **and** $\overline{AC}$ **are diameters of** $\odot O$**. Identify each arc as a** ***major arc***, ***minor arc***, **or** ***semicircle*** **of the circle. Then find its measure.**



3. $m\widehat{BA}$ minor ; 44°
4. $m\widehat{BC}$ minor ; 136°
5. $m\widehat{CD}$ minor ; 44°
6. $m\widehat{ACB}$ major ; 316°
7. $m\widehat{BCD}$ Semicircle ; 180°
8. $m\widehat{AD}$ minor ; 136°

NAME ______________________ DATE ____________ PERIOD ____________

10-2 Study Guide and Intervention *(continued)*

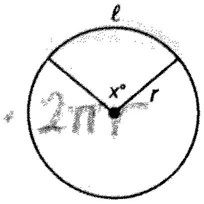
Measuring Angles and Arcs

Arc Length An arc is part of a circle and its length is a part of the circumference of the circle.

The length of arc ℓ can be found using the following equations:

$\ell = \frac{x}{360} \cdot 2\pi r$

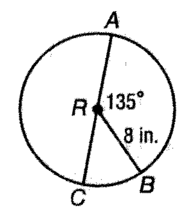
Arc Length = $\frac{\text{Central } \angle}{360} \cdot 2\pi r$



Example **Find the length of $\widehat{AB}$. Round to the nearest hundredth.**

The length of arc l, can be found using the following equation: $\widehat{AB} = \frac{x}{360} \cdot 2\pi r$

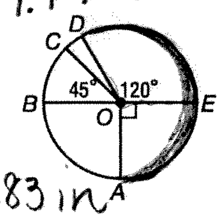
$\widehat{AB} = \frac{x}{360} \cdot 2\pi r$	Arc Length Equation
$\widehat{AB} = \frac{135}{360} \cdot 2\pi(8)$	Substitution
$\widehat{AB} \approx 18.85$ in.	Use a calculator.



Exercises

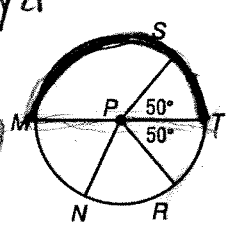
Use ⊙O to find the length of each arc. Round to the nearest hundredth.

1. $\widehat{DE}$ if the radius is 2 meters $\quad \ell = \frac{120}{360} \cdot 2\pi(2) \approx 4.19$ m
2. $\widehat{DEA}$ if the diameter is 7 inches $\quad \ell = \frac{210}{360} \cdot 2\pi(3.5) \approx 12.83$ in
3. $\widehat{BC}$ if $BE = 24$ feet
4. $\widehat{CBA}$ if $DO = 3$ millimeters



Use ⊙P to find the length of each arc. Round to the nearest hundredth.

5. $\widehat{RT}$, if $MT = 7$ yards $\quad \ell = \frac{50}{360} \cdot 2\pi(3.5) \approx 3.05$ yd
6. $\widehat{NR}$, if $PR = 13$ feet
7. $\widehat{MST}$, if $MP = 2$ inches $\quad \ell = \frac{1}{\cancel{2}} \cdot \cancel{2}\pi(2) \approx 6.28$ in
8. $\widehat{MRS}$, if $NS = 10$ centimeters



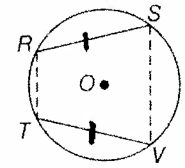
Triple
3 4 5
5 12 13
6 8 10

NAME ______________________ DATE ____________ PERIOD ____________

10-3 Study Guide and Intervention

Arcs and Chords

Arcs and Chords Points on a circle determine both chords and arcs. Several properties are related to points on a circle. In a circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.



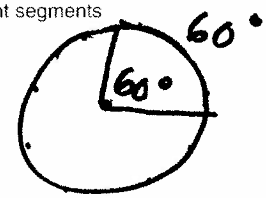
$\overset{\frown}{RS} \cong \overset{\frown}{TV}$ if and only if $\overline{RS} \cong \overline{TV}$.

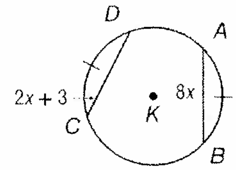
Example **In $\odot K$, $\overset{\frown}{AB} \cong \overset{\frown}{CD}$. Find AB.**

$\overset{\frown}{AB}$ and $\overset{\frown}{CD}$ are congruent arcs, so the corresponding chords $\overline{AB}$ and $\overline{CD}$ are congruent.

$AB = CD$	Definition of congruent segments
$8x = 2x + 3$	Substitution
$x = 2$	Simplify.

So, $AB = 8(2)$ or 16.

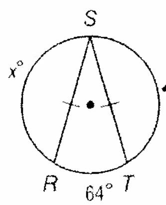




Exercises

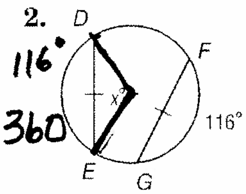
ALGEBRA Find the value of x in each circle.

1.



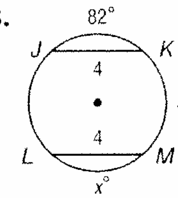
$x°$
$2x+64=360$
$x=148$

2.



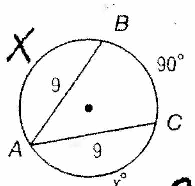
116°
$x=116$

3.



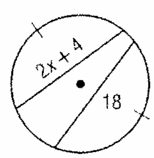
$x=82$

4.

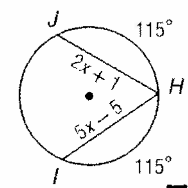


x
$2x+90=360$
$x=135$

5.

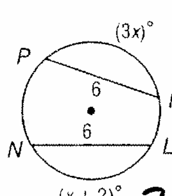


6.



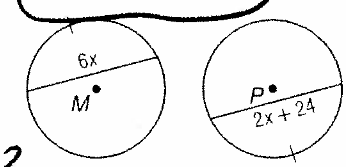
$2x+1=5x-5$
$x=2$

7.



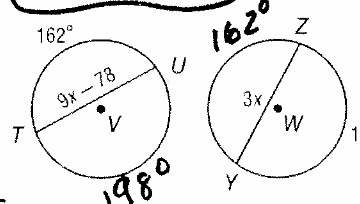
$3x=x+2$
$x=1$

8. $\odot M \cong \odot P$



$6x=2x+24$
$x=6$

9. $\odot V \cong \odot W$



$9x-78=3x$

Lesson 10-3

$x=13$

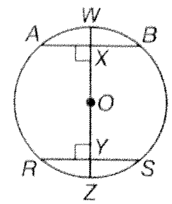
NAME ______________________ DATE __________ PERIOD __________

10-3 Study Guide and Intervention *(continued)*

Arcs and Chords

Diameters and Chords

- In a circle, if a diameter (or radius) is perpendicular to a chord, then it bisects the chord and its arc.
- In a circle, the perpendicular bisector of a chord is the diameter (or radius).
- In a circle or in congruent circles, two chords are congruent if and only if they are equidistant from the center.

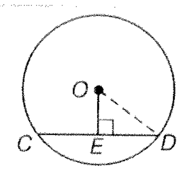


If $\overline{WZ} \perp \overline{AB}$, then $\overline{AX} \cong \overline{XB}$ and $\widehat{AW} \cong \widehat{WB}$.

If $OX = OY$, then $\overline{AB} \cong \overline{RS}$.

If $\overline{AB} \cong \overline{RS}$, then $\overline{AB}$ and $\overline{RS}$ are equidistant from point O.

Example **In $\odot O$, $\overline{CD} \perp \overline{OE}$, $OD = 15$, and $CD = 24$. Find OE.**



A diameter or radius perpendicular to a chord bisects the chord, so ED is half of CD.

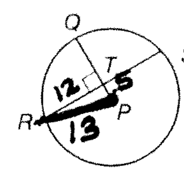
$ED = \frac{1}{2}(24)$
$= 12$

Use the Pythagorean Theorem to find x in $\triangle OED$.

$(OE)^2 + (ED)^2 = (OD)^2$	Pythagorean Theorem
$(OE)^2 + 12^2 = 15^2$	Substitution
$(OE)^2 + 144 = 225$	Simplify.
$(OE)^2 = 81$	Subtract 144 from each side.
$OE = 9$	Take the positive square root of each side.

Exercises

In $\odot P$, the radius is 13 and $RS = 24$. Find each measure. Round to the nearest hundredth.

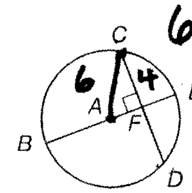


$13^2 - 12^2$

1. RT 12
2. PT 5
3. TQ 13 − 5
   8

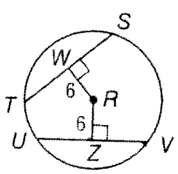
In $\odot A$, the diameter is 12, $CD = 8$, and $m\widehat{CD} = 90$. Find each measure. Round to the nearest hundredth.

$6^2 - 4^2$



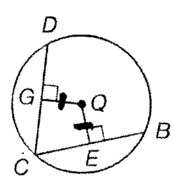
4. $m\widehat{DE}$ $45°$
5. FD $= 4$
6. AF $\sqrt{20} \approx 4.47$

7. In $\odot R$, $TS = 21$ and $UV = 3x$. What is x?



$21 = 3x$
$7 = x$

8. In $\odot Q$, $\overline{CD} \cong \overline{CB}$, $GQ = x + 5$ and $EQ = 3x - 6$. What is x?



$x + 5 = 3x - 6$
$x = 5.5$